

# Human centric decisions and choice using pros-and-cons analyses via a fuzzy approach to bipolarity in intentions, judgments and evaluations

**Janusz Kacprzyk**

Fellow of IEEE, IET, EurAI, IFSA, IFIP, AAIA, SMIA

Systems Research Institute

Polish Academy of Sciences

Newelska 6

01-447 Warsaw, Poland

Email: [kacprzyk@ibspan.waw.pl](mailto:kacprzyk@ibspan.waw.pl)



## **Abstract**

We are concerned with an old, and very often effective and efficient method of decision making and choice which is often attributed to Benjamin Franklin. In our context, this method boils down to an explicit listing, and then taking into account the pros and cons, i.e. arguments for and against a particular option or its aspect.

First, we are concerned on how to find (retrieve) a proper information reflecting the human needs, interests, intentions, preferences, etc. from data sources available, and then how to purposefully use that information for decision making (choice), i.e. for selecting a best (maybe good) option that best satisfies some requirements. Since decisions are made by humans, and for the humans, even if mimicked by inanimate (e.g. multiagent) systems, then the decision making is a clear human centric/centered problem and this feature should be taken into account.

Traditionally, in the formal direction, decision making boils down to finding a best option, usually using some strict and formal choice or optimization tools, but in reality it may be good to add some “softer” elements to our models, to make them more human consistent, notably via some adequate representations of human judgments, attitudes, preferences and intentions. In this context, it may be effective and efficient to involve an element of bipolarity, meant as a positive and negative, necessary and optional, etc. human judgments, attitudes, preferences and intentions, or the pros

and cons, for short.

We show how to formalize such bipolarity using our fuzzy logic based approach to the choice problem rephrased in terms of database querying, and show how it can be employed to extend it via this pros and cons perspective, i.e. that there is a bipolarity in the decision maker's judgments, intentions and preferences which boils down to the specification of what is good and bad, positive and negative, necessary and optional, and therefore what should result in the rejection and acceptance of an option or course of action. We also present some extensions by explicitly accounting for context in which the problem is considered. We present some examples of problems faced by real estate agents who obtain from their potential customers sophisticated request like: "I am interested in a house which is more or less within my price limit "and, if possibly", close to public transportation, or – when context is involved – find such a house among houses that are possibly characteristic for a specific zone. The "and, if possibly" is a non-standard aggregation which is the essence of the approach.

Janusz Kacprzyk is Professor of Computer Science at the Systems Research Institute, Polish Academy of Sciences, WIT – Warsaw School of Information Technology, and Chongqing Three Gorges University, Wanzhou, Chongqing, China, and Professor of Automatic Control at PIAP – Industrial Institute of Automation and Measurements in Warsaw, Poland. He is Honorary Foreign Professor at the Department of Mathematics, Yli Normal University, Xinjiang, China. He is Full Member of the Polish Academy of Sciences, Member of Academia Europaea, European Academy of Sciences and Arts, European Academy of Sciences, Foreign Member of the: Bulgarian Academy of Sciences, Spanish Royal Academy of Economic and Financial Sciences (RACEF), Finnish Society of Sciences and Letters, Flemish Royal Academy of Belgium of Sciences and the Arts (KVAB), National Academy of Sciences of Ukraine and Lithuanian Academy of Sciences. He was awarded with 6 honorary doctorates. He is Fellow of IEEE, IET, IFSA, EurAI, IFIP, AAIA, I2CICC, and SMIA.

His main research interests include the use of modern computation computational and artificial intelligence tools, notably fuzzy logic, in systems science, decision making, optimization, control, data analysis and data mining, with applications in mobile robotics, systems modeling, ICT etc.

He authored 7 books, (co)edited more than 150 volumes, (co)authored more than 650 papers, including ca. 150 in journals indexed by the WoS. He is listed in 2020 and 2021 "World's 2% Top Scientists" by Stanford University, Elsevier (Scopus) and ScieTech Strategies and published in PLOS Biology Journal.

He is the editor in chief of 8 book series at Springer, and of 2 journals, and is on the editorial boards of ca. 40 journals.. He is President of the Polish Operational and Systems Research Society and Past President of International Fuzzy Systems Association.